ADDITIONAL FEES:

No additional fees are believed required; however, should it be determined that a fee is due, authorization is hereby given to charge any such fee to our Deposit Account No. 01-0268.

REMARKS

In the last Office Action, the Examiner rejected claims 48-51 under 35 U.S.C. §112, second paragraph, for indefiniteness. Claims 1-4, 22-32 and 48-51 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,692,649 to Izukawa et al. ("Izukawa"), U.S. Patent No. 5,001,404 to Kataoka or U.S. Patent No. 5,198,714 to Salomon et al. ("Salomon") in view of U.S. Patent No. 5,780,955 to Iino et al. ("Iino '955) or U.S. Patent No. 6,064,138 to Iino et al. ("Iino '138"). Claims 6-14 and 33-47 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,763,981 to Okazaki et al. ("Okazaki") in view of U.S. Patent No. 5,406,160 to Shirasaki or U.S. Patent No. 5,438,229 to Ohtsuchi et al. ("Ohtsuchi") in view of Iino '955. Claims 5, 33 and 34 were allowed over the prior art of record.

Applicants and applicant's counsel note with appreciation the indication of allowable subject matter concerning claims 5, 33 and 34. However, for the reasons noted below, applicants respectfully submit that claims 1-4,

6-14, 22-32 and 35-51 also patentably distinguish from the prior art of record.

In accordance with the present response, independent claim 48 has been amended to overcome the indefiniteness rejection raised by the Examiner. Independent claims 2, 3, 6, 11 and 12 have been amended to further distinguish from the cited references by reciting the feature of the relative position of the detecting polarized portion (claims 2, 3 and 6) and the relative position of the detecting electrode (claims 11 and 12) recited in independent claims 1 and 48, respectively. More specifically, claims 2, 3 and 6 have been amended to recite that the detecting polarized portion is disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member. Likewise, claims 11 and 12 have been amended to recite that the detecting electrode is disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member. As discussed below, the cited references do not disclose or suggest this structural feature and hence do not suggest the claimed invention.

The amendment to the claims made herein do not raise new issues requiring further search and/or consideration. Instead, independent claim 48 has been amended to overcome the

indefiniteness rejection raised by the Examiner, and independent claims 2, 3, 6, 11 and 12 have been amended to define with more particularity the relative position of the detecting polarized portion (claims 2, 3 and 6) and the detecting electrode (claims 11 and 12) which patentably distinguishes the claims over the prior art of record, thereby placing the application in condition for allowance or otherwise reducing the issues which remain for appeal.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached pages i-v are captioned **"VERSION WITH MARKINGS TO SHOW CHANGES MADE."**

Applicants respectfully request reconsideration of their application in light of the following discussion.

Brief Summary of the Invention

The present invention is directed to an ultrasonic motor and to an electronic apparatus equipped with the ultrasonic motor.

An embodiment of the ultrasonic motor according to the present invention is shown in Figs. 6A-6B. The ultrasonic motor comprises a piezoelectric vibrating member 5 having a detecting polarized portion 12c for detecting a drive signal having a drive frequency of the detecting polarized portion and a driving polarized portion 12a for receiving the drive

signal to oscillate the piezoelectric vibrating member in self-excited oscillation to produce a drive force. The detecting polarized portion 12c is disposed at a portion of the piezoelectric vibrating member 5 which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member. An amplifying circuit 13 amplifies the drive signal detected by the detecting polarized portion 12c and inputs the amplified signal to the driving polarized portion 12a to oscillate the piezoelectric vibrating member 5.

Another embodiment of the ultrasonic motor according to the present invention is shown in Figs. 9-10. The ultrasonic motor comprises a piezoelectric vibrating member 16 having a detecting polarized portion 18c for detecting a drive signal having a drive frequency of the detecting polarized portion and a driving polarized portion 18a for receiving the drive signal to produce a flexion vibration wave for oscillating the piezoelectric vibrating member 16 in self-excited oscillation to produce a drive force. The detecting polarized portion 18c is disposed at a portion of the piezoelectric vibrating member 16 which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member 16, and is disposed on the piezoelectric vibrating member 16 at a position symmetrical about a loop of the flexion vibration wave. An amplifying

circuit 22 amplifies the drive signal detected by the detecting polarized portion 18c and inputs the amplified signal to the driving polarized portion 18a to oscillate the piezoelectric vibrating member 16.

In another aspect, the present invention is directed to an electronic apparatus. As shown in the embodiment of Fig. 32, for example, the electronic apparatus comprises a moving member 96 connected to a piezoelectric vibrating member 95 of an ultrasonic motor according to any of the foregoing embodiments of the present invention, an output mechanism 99, and a transmission mechanism 98 for transmitting movement of the moving member 96 to the output mechanism 99.

By the foregoing construction of the ultrasonic motor and electronic apparatus of the present invention, the arrangement of the detecting and driving polarized portions provides a self-excited oscillation driving circuit which has high stability and which is compact and economical to manufacture. Accordingly, the ultrasonic motor of the present invention can be rotated with highly improved motor performance, stability and environmental reliability as compared to the complex control and driving circuits employed by the conventional art.

Applicants respectfully submit that the prior art of record does not disclose or suggest the subject matter recited in claims 1-4, 6-14, 22-32 and 35-51.

Traversal of Prior Art Rejections

Claims 1-4, 22-32 and 48-51 were rejected under 35 U.S.C. §103(a) as being unpatentable over Izukawa, Kataoka or Salomon in view of Iino '955 or Iino '138. Applicants respectfully traverse this rejection and submit that the combined teachings of the references do not disclose or suggest the subject matter recited in claims 1-4, 22-32 and 48-51.

Independent claim 1 is directed to an ultrasonic motor and requires a piezoelectric vibrating member having a detecting polarized portion for detecting a drive signal having a drive frequency of the detecting polarized portion and a driving polarized portion for receiving the drive signal to oscillate the piezoelectric vibrating member in self-excited oscillation to produce a drive force. Claim 1 further requires that the detecting polarized portion is disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member. Claim 1 further requires an amplifying circuit for amplifying the drive signal detected by the detecting polarized portion and inputting the amplified signal to the driving polarized portion to oscillate the piezoelectric vibrating member.

Amended independent claim 2 is also directed to an ultrasonic motor and requires a piezoelectric vibrating member

having a detecting polarized portion for detecting a drive signal having a drive frequency of the detecting polarized portion and a driving polarized portion for receiving the drive signal to produce a flexion vibration wave for oscillating the piezoelectric vibrating member in self-excited oscillation to produce a drive force. Claim 2 further requires that the detecting polarized portion is disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member and is disposed at a position symmetrical about a loop of the flexion vibration wave. Claim 2 further requires an amplifying circuit for amplifying the drive signal detected by the detecting polarized portion and inputting the amplified signal to the driving polarized portion to oscillate the piezoelectric vibrating member.

Amended independent claim 3 is also directed to an ultrasonic motor and requires a piezoelectric vibrating member having a first driving polarized portion for generating a first flexion vibration wave, a second driving polarized portion for generating a second flexion vibration wave having a phase different from that of the first flexion vibration wave, and a detecting polarized portion disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of

the piezoelectric vibrating member and disposed at a position symmetrical about a loop of one of the first flexion vibration wave and the second flexion vibration wave for detecting a drive signal having a drive frequency of the detecting polarized portion in accordance with oscillation of the first driving polarized portion. Claim 3 further requires an amplifying circuit for amplifying the drive signal detected by the detecting polarized portion and inputting the amplified signal to one of the first and second driving polarized portions for oscillating the piezoelectric vibrating member in self-excited oscillation to produce a drive force.

Independent claim 48 is also directed to an ultrasonic motor and requires a piezoelectric vibrating member, and a driving circuit for applying an exciting signal to the piezoelectric vibrating member to oscillate the piezoelectric vibrating member in self-excited oscillation. Claim 48 further requires that the driving circuit has a detecting electrode for detecting the exciting signal and disposed at a portion of the piezoelectric vibrating member for undergoing maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member, a driving electrode for receiving the exciting signal, and an amplifying circuit for amplifying the exciting signal detected by the detecting electrode and inputting the amplified signal to the driving electrode.

Independent claims 1-3 and 48 recite features which are not disclosed or suggested by the combined teachings of Izukawa, Kataoka, Salomon, Iino '955 and Iino '138.

The primary references to Izukawa, Kataoka and Salomon disclose driving circuits for vibration motors. As acknowledged by the Examiner, the primary references do not disclose or suggest self-oscillating driving circuits, as required by independent claims 1-3 and 48. Accordingly, the primary references do not disclose or describe a piezoelectric vibrating member having a detecting polarized portion for detecting a drive signal having a drive frequency of the detecting polarized portion and a driving polarized portion for receiving the drive signal to oscillate the piezoelectric vibrating member in self-excited oscillation to produce a drive force, as required by claims 1 and 2. Likewise, the primary references do not disclose or suggest an amplifying circuit for amplifying the drive signal detected by the detecting polarized portion and inputting the amplified signal to one of the first and second driving polarized portions for oscillating the piezoelectric vibrating member in self-excited oscillation to produce a drive force, as recited in claim 3. Likewise, the primary references do not disclose or suggest a driving circuit for applying an exciting signal to the piezoelectric vibrating member to oscillate the piezoelectric

vibrating member in self-excited oscillation, as recited in claim 48.

Furthermore, the primary references do not disclose or suggest a detecting polarized portion disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member, as required by independent claims 1-3. Likewise, the primary references do not disclose or suggest a detecting electrode for detecting the exciting signal and disposed at a portion of the piezoelectric vibrating member for undergoing maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member, as required by independent claim 48.

The Examiner cited the secondary references to Iino '955 and Iino '138 for their disclosure of self-excited vibration circuits. However, Iino '955 and Iino '138 do not disclose or suggest a detecting polarized portion disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member, as required by independent claims 1-3. Likewise, Iino '955 and Iino '138 do not disclose or suggest a detecting electrode for detecting the exciting signal and disposed at a portion of the piezoelectric vibrating member for undergoing maximum deformation in at least one vibration mode of oscillation of

the piezoelectric vibrating member, as required by independent claim 48. Since Iino '955 and Iino '138 do not disclose or suggest these features, they do not cure the deficiencies of Izukawa, Kataoka and Salomon and, therefore, one ordinarily skilled in the art would not have been led to modify the references to attain the claimed subject matter.

Claims 4, 10, 22-32 and 49-51 depend on and contain all of the limitations of independent claims 1-3 and 48, respectively, and, therefore, distinguish from the references at least in the same manner as claims 1-3 and 48.

In view of the foregoing, applicants respectfully request that the rejection of claims 1-4, 22-32 and 48-51 under 35 U.S.C. §103(a) as being unpatentable over Izukawa, Kataoka or Salomon in view of Iino '955 or Iino '138 be withdrawn.

Claims 6-14 and 33-47 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okazaki in view of Shirasaki or Ohtsuchi and further in view of Iino '955. Applicants respectfully traverse this rejection and submit that the combined teachings of the references do not disclose or suggest the subject matter recited in claims 6-14 and 33-47.

Amended independent claim 6 is directed to an ultrasonic motor and requires a detecting polarized portion disposed at a portion of the piezoelectric vibrating member

which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member and disposed at a position symmetrical about one of a node of the stretching vibration wave and a loop of the flexion vibration wave for detecting a drive signal having a drive frequency of the detecting polarized portion in accordance with oscillation of one of the first driving polarized portion and the second driving polarized portion, respectively. Claim 6 further requires amplifying means for amplifying the drive signal detected by the detecting polarized portion and inputting the amplified signal to the first and second driving polarized portions for oscillating the piezoelectric vibrating member in self-excited oscillation to produce a drive force

Amended independent claim 11 is also directed to an ultrasonic motor and requires a driving electrode disposed on the piezoelectric vibrating member for undergoing vertical vibration to vibrate the piezoelectric vibrating member in self-excited vibration to produce a drive force, a detecting electrode disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member, and an amplifying circuit for amplifying the drive signal detected by the detecting electrode and inputting the amplified drive signal to the driving electrode to vibrate the piezoelectric vibrating member.

Amended independent claim 12 is also directed to an ultrasonic motor and requires a driving electrode disposed on the piezoelectric vibrating member for undergoing torsional vibration to vibrate the piezoelectric vibrating member in self-excited vibration to produce a drive force, a detecting electrode disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member, and an amplifying circuit for amplifying the drive signal detected by the detecting electrode and inputting the amplified drive signal to the driving electrode to vibrate the piezoelectric vibrating member.

The primary reference to Okazaki discloses a vibration actuator. As acknowledged by the Examiner, Okazaki does not disclose or suggest a self-oscillating drive circuit as required by independent claims 6, 11 and 12. Furthermore, Okazaki does not disclose or suggest a detecting polarized portion disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member, as required by independent claim 6. Likewise, Okazaki does not disclose or suggest a detecting electrode disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode

of oscillation of the piezoelectric vibrating member, as required by independent claims 11 and 12.

Furthermore, Okazaki does not disclose or suggest a detecting polarized portion disposed at a position symmetrical about one of a node of the stretching vibration wave and a loop of the flexion vibration wave for detecting a drive signal having a drive frequency of the detecting polarized portion (claim 6), and a detecting electrode for detecting a drive signal having a drive frequency of the detecting electrode (claims 11, 12), as required by claims 6, 11 and 12.

The secondary references to Shirasaki, Ohtsuchi and Iino '955 have been cited by the Examiner for their disclosure of feed-back circuitry having polarized piezoelectric detection electrodes (Shirasaki and Ohtsuchi) and a self-oscillation drive circuit (Iino '955). However, the secondary references do not disclose or suggest a detecting polarized portion disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member, as required by independent claim 6. Likewise, the secondary references do not disclose or suggest a detecting electrode disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member, as required by independent claims 11 and 12.

Moreover, Ohtsuchi does not disclose or describe a detecting electrode for detecting a drive signal having a drive frequency of the detecting electrode in accordance with vibration of the driving electrode, as recited in independent claims 11 and 12. In this regard, Ohtsuchi discloses a vibration detection electrode for detecting an amplitude of vibration of a vibrating body, not a drive signal.

Since the secondary references do not disclose or suggest the foregoing features recited in independent claims 6, 11 and 12, they do not cure the deficiencies of Okazaki and, therefore, one ordinarily skilled in the art would not have been led to modify the references to attain the claimed subject matter.

Claims 7-9, 13, 14 and 35-47 depend on and contain all of the limitations of amended independent claims 6, 11 and 12, respectively, and, therefore, distinguish from the references at least in the same manner as claims 6, 11 and 12.

In view of the foregoing, applicants respectfully request that the rejection of claims 6-14 and 33-47 under 35 U.S.C. §103(a) as being unpatentable over Okazaki in view of Shirazaki or Ohtsuchi and further in view of Iino '955 be withdrawn.

The amendment to the claims made herein do not raise new issues requiring further search and/or consideration. Instead, independent claim 48 has been amended to overcome the

indefiniteness rejection raised by the Examiner, and independent claims 2, 3, 6, 11 and 12 have been amended to define with more particularity the relative position of the detecting polarized portion (claims 2, 3 and 6) and the detecting electrode (claims 11 and 12) which patentably distinguishes the claims over the prior art of record, thereby placing the application in condition for allowance or otherwise reducing the issues which remain for appeal.

In view of the foregoing, applicants respectfully submit that the application is now in condition for allowance. Accordingly, entry of this amendment and favorable reconsideration and allowance of the claims are most respectfully requested.

Respectfully submitted,

ADAMS & WILKS
Attorneys for Applicants

By: _____
Bruce L. Adams
Reg. No. 25,386

50 Broadway
31st Floor
New York, NY 10004
(212) 809-3700

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 2, 3, 6, 11, 12 and 48 have been amended as follows:

2. (Twice Amended) An ultrasonic motor comprising: a piezoelectric vibrating member having a detecting polarized portion for detecting a drive signal having a drive frequency of the detecting polarized portion and a driving polarized portion for receiving the drive signal to produce a flexion vibration wave for oscillating the piezoelectric vibrating member in self-excited oscillation to produce a drive force, the detecting polarized portion being disposed [on] at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member and being disposed at a position symmetrical about a loop of the flexion vibration wave; and an amplifying circuit for amplifying the drive signal detected by the detecting polarized portion and inputting the amplified signal to the driving polarized portion to oscillate the piezoelectric vibrating member.

3. (Twice Amended) An ultrasonic motor comprising: a piezoelectric vibrating member having a first driving polarized portion for generating a first flexion vibration

wave, a second driving polarized portion for generating a second flexion vibration wave having a phase different from that of the first flexion vibration wave, and a detecting polarized portion disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member and disposed at a position symmetrical about a loop of one of the first flexion vibration wave and the second flexion vibration wave for detecting a drive signal having a drive frequency of the detecting polarized portion in accordance with oscillation of the first driving polarized portion; and an amplifying circuit for amplifying the drive signal detected by the detecting polarized portion and inputting the amplified signal to one of the first and second driving polarized portions for oscillating the piezoelectric vibrating member in self-excited oscillation to produce a drive force.

6. (Twice Amended) An ultrasonic motor comprising: a piezoelectric vibrating member having a first driving polarized portion for generating a stretching vibration wave, a second driving polarized portion for generating a flexion vibrating wave, and a detecting polarized portion disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member and

disposed at a position symmetrical about one of a node of the stretching vibration wave and a loop of the flexion vibration wave for detecting a drive signal having a drive frequency of the detecting polarized portion in accordance with oscillation of one of the first driving polarized portion and the second driving polarized portion, respectively; and amplifying means for amplifying the drive signal detected by the detecting polarized portion and inputting the amplified signal to the first and second driving polarized portions for oscillating the piezoelectric vibrating member in self-excited oscillation to produce a drive force.

11. (Twice Amended) An ultrasonic motor comprising: a piezoelectric vibrating member; a driving electrode disposed on the piezoelectric vibrating member for undergoing vertical vibration to vibrate the piezoelectric vibrating member in self-excited vibration to produce a drive force; a detecting electrode for detecting a drive signal having a drive frequency of the detecting electrode in accordance with vibration of the driving electrode, the detecting electrode being disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member; and an amplifying circuit for amplifying the drive signal detected by the detecting electrode and inputting the

amplified drive signal to the driving electrode to vibrate the piezoelectric vibrating member.

12. (Twice Amended) An ultrasonic motor comprising: a piezoelectric vibrating member; a driving electrode disposed on the piezoelectric vibrating member for undergoing torsional vibration to vibrate the piezoelectric vibrating member in self-excited vibration to produce a drive force; a detecting electrode for detecting a drive signal having a drive frequency of the detecting electrode in accordance with vibration of the driving electrode, the detecting electrode being disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member; and an amplifying circuit for amplifying the drive signal detected by the detecting electrode and inputting the amplified drive signal to the driving electrode to vibrate the piezoelectric vibrating member.

48. (Amended) An ultrasonic motor comprising: a piezoelectric vibrating member; and a driving circuit for applying an exciting signal to the piezoelectric vibrating member to oscillate the piezoelectric vibrating member in self-excited oscillation, the driving circuit having a detecting electrode for detecting the exciting signal and disposed at a portion of the piezoelectric vibrating member

for undergoing maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member, a driving electrode for receiving the exciting signal, and an amplifying circuit for amplifying the exciting signal detected by the detecting electrode [polarized portion] and inputting the amplified signal to the driving electrode [polarized portion].

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